

November 21, 2016

VIA ELECTRONIC FILING

Ms. Erica Hamilton, Commission Secretary
British Columbia Utilities Commission
Box 250, 900 Howe Street
Sixth Floor
Vancouver, B.C.
V6Z 2N3

Re: *North American Electric Reliability Corporation*

Dear Ms. Hamilton:

The North American Electric Reliability Corporation hereby submits Supplemental Information for Notice of Filing of the North American Electric Reliability Corporation of Retirement of Regional Reliability Standard TOP-007-WECC-1a.

Please contact the undersigned if you have any questions concerning this filing.

Respectfully submitted,

/s/ Shamai Elstein

Shamai Elstein
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Enclosure

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**BEFORE THE
BRITISH COLUMBIA UTILITIES COMMISSION
OF THE PROVINCE OF BRITISH COLUMBIA**

**NORTH AMERICAN ELECTRIC)
RELIABILITY CORPORATION)**

**SUPPLEMENTAL INFORMATION FOR NOTICE OF FILING OF THE
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION OF RETIREMENT
OF REGIONAL RELIABILITY STANDARD TOP-007-WECC-1a**

The North American Electric Reliability Corporation (“NERC”) hereby submits supplemental information (“Supplement”) to its April 21, 2016 filing (“Filing”) providing notice of the retirement of WECC regional Reliability Standard TOP-007-WECC-1a – System Operating Limits.¹ This Supplement provides additional background information on TOP-007-WECC-1a, the purpose of the proposed retirement, and the manner in which the reliability of the 40 Transmission paths currently subject to TOP-007-WECC-1a is addressed under the continent-wide Transmission Operations (“TOP”) and Interconnection Reliability Operations and Coordination (“IRO”) Reliability Standards.²

As discussed below, regional Reliability Standard TOP-007-WECC-1a reflects a historical, path-centric operating paradigm unique to the Western Interconnection. This paradigm is focused on identifying a single, pre-determined transfer capability value for an entire Transmission path, which, if operated within, was intended to provide for reliable operation by preventing a pre-determined limiting Contingency from resulting in an exceedance of a specific thermal Facility

¹ Unless otherwise designated herein, all capitalized terms shall have the meaning set forth in the *Glossary of Terms Used in NERC Reliability Standards* (“NERC Glossary”), available at http://www.nerc.com/files/Glossary_of_Terms.pdf.

² As provided in Section 4 of the standard, regional Reliability Standard TOP-007-WECC-1a applies only to the 40 Transmission paths listed in the table titled “Major WECC Transfer Paths in the Bulk Electric System,” provided at <https://www.wecc.biz/Reliability/TableMajorPaths4-28-08.pdf>.

Rating, system voltage limit, or stability limit. With the development of advanced applications for Real-time analysis, however, the paradigm upon which TOP-007-WECC-1a is based no longer aligns with current operating practices nor does it provide an optimal framework for reliably operating the Bulk-Power System (“BPS”).

The purpose of the proposed retirement of TOP-007-WECC-1a is to shift away from the path-centric paradigm and allow entities in the Western Interconnection to align their operating practices with the framework established in the continent-wide TOP/IRO Reliability Standards submitted on March 25, 2015³ and approved by the Federal Energy Regulatory Commission (“FERC”) in Order No. 817.⁴ As the FERC recognized, that framework provides for a comprehensive and reliable approach to, among other things, achieving the objective of operating within acceptable pre- and post-Contingency reliability criteria (i.e., within System Operating Limits (“SOLs”) and Interconnection Reliability Operating Limits (“IROL”).⁵ The retirement of TOP-007-WECC-1a would have no adverse effect on reliability. As discussed below, there is no reliability need to continue the historical, path-centric approach reflected in TOP-007-WECC-1a or to treat the facilities comprising the 40 Transmission paths subject to TOP-007-WECC-1a any differently than all other facilities are treated under the continent-wide TOP/IRO Reliability Standards. Each of the facilities comprising these 40 Transmission paths would be monitored in accordance with the TOP/IRO Reliability Standards and subject to associated mitigation requirements should there be an expected or actual exceedance of an SOL or IROL on those facilities.

³ See Notice of Filing of the North American Electric Reliability Corporation of Proposed Transmission Operations and Interconnection Reliability Operations and Coordination Reliability Standards (March 25, 2015).

⁴ Transmission Operations Reliability Standards and Interconnection Reliability Operations and Coordination Reliability Standards, Order No. 817, 153 FERC ¶ 61,178, 80 Fed. Reg. 73977 (2015).

⁵ *Id.* at PP 14-17.

Following additional discussion of the history of TOP-007-WECC-1a (Section I.a), the operational paradigm underlying the regional standard (Section I.b), and the purpose of retiring the regional standard (Section II), this Supplement discusses the following:

- The manner in which Peak Reliability (“Peak”), as the Reliability Coordinator for the Western Interconnection (except in Alberta, Canada), and Transmission Operators and Balancing Authorities would continue to monitor and assess conditions on the 40 Transmission paths under the continent-wide TOP/IRO Reliability Standards. (Section III.a).
- Whether the 30-minute mitigation requirement in TOP-007-WECC-1a would continue to apply to the 40 Transmission paths following retirement of the standard and, if not, the basis for no longer applying such a requirement to each path. (Section III.b).
- The process for establishing SOLs and IROLs for each of the facilities comprising the 40 Transmission paths and the type of limitations associated with those paths. (Section III.c).
- Peak’s intent to modify its methodology for establishing SOLs and IROLs and the manner in which such revisions could impact the evaluation of the 40 Transmission paths under the TOP/IRO Reliability Standards. (Section III.d).
- Peak’s use of a 1000 MW threshold in its current methodology for determining IROLs and the manner in which that threshold applies to the 40 Transmission paths subject to TOP-007-WECC-1a. (Section III.e).

I. Background

a. History of Regional Reliability Standard TOP-007-WECC-1a

Regional Reliability Standard TOP-007-WECC-1a and the operating paradigm upon which it is based derive from the reliability criteria in WECC’s Reliability Management System (“RMS”), which predates the enactment of the U.S. Energy Policy Act of 2005 (“EPAAct 2005”)⁶ and NERC’s mandatory Reliability Standards under Section 215 of the U.S. Federal Power Act (“FPA”).⁷ The RMS, which is no longer in effect, was developed in the late 1990s in response to a series of black-outs in the Western Interconnection and established the reliability criteria to which

⁶ Energy Policy Act of 2005, Pub. L. No. 109-58, Title XII, Subtitle A, 119 Stat. 594, 941 (2005).

⁷ 16 U.S.C. § 824o (2012).

Transmission Operators in the Western Interconnection agreed to be bound.⁸ Among other things, the RMS reliability criteria set forth an operating paradigm focused on identifying a single, pre-determined maximum flow value for major WECC Transmission paths and requiring Transmission Operators to operate within that value to achieve reliable operations.

More specifically, the RMS criteria provided that actual power flows for certain major Transmission paths in the Western Interconnection shall at no time exceed the Operating Transfer Capability Limits (“OTC”) for those paths for more than 20 minutes for stability limited paths or for more than 30 minutes for thermally limited paths.⁹ As provided in the RMS, OTC is determined on a seasonal basis and represents “the maximum amount of actual power that can be transferred over direct or parallel transmission elements comprising: (1) an interconnection from one Control Area to another Control Area;¹⁰ or (2) a transfer path within a Control Area.¹¹ The OTC thus reflected a pre-determined transfer capability value for an entire path (a “Path OTC”) which, if operated within, was intended to prevent a pre-determined limiting Contingency from resulting in an exceedance of a specified thermal Facility Rating, system voltage limit, or stability

⁸ The RMS was initially established by Western Systems Coordinating Council (“WSCC”), which is one of the three predecessor entities to WECC. WECC was formed on April 18, 2002, by the merger of the WSCC, Southwest Regional Transmission Association, and Western Regional Transmission Association. FERC approved the initial RMS criteria in 1999. *Western Systems Coordinating Council*, 87 FERC ¶ 61,060 (1999).

⁹ Under the RMS, OTC is defined as “the maximum value of the most critical system operating parameter(s) which meets: (a) precontingency criteria as determined by equipment loading capability and acceptable voltage conditions, (b) transient criteria as determined by equipment loading capability and acceptable voltage conditions, (c) transient performance criteria, and (d) post contingency loading and voltage criteria.”

¹⁰ The RMS defined “Control Area” as “an electric system or systems, bounded by interconnection metering and telemetry, capable of controlling generation to maintain its interchange schedule with other Control Areas and contributing to frequency regulation of the Western Interconnection. As used herein, the term ‘Control Area’ shall have the same meaning as the term ‘Balancing Authority Area’ or ‘Balancing Authority,’ as applicable, as such terms are used in the NERC Standards.”

¹¹ In this respect, OTC is closely associated with the *NERC Glossary* term “Total Transfer Capability,” which is defined as “[t]he amount of electric power that can be moved or transferred reliably from one area to another area of the interconnected transmission systems by way of all transmission lines (or paths) between those areas under specified system conditions.”

limit.¹² The OTC criteria essentially married the concept of operating limits and transfer limits in a single parameter for WECC Transmission paths.

Following the enactment of EPCRA 2005 and the establishment of mandatory Reliability Standards applicable to all owners, operators, and users of the BPS, WECC sought to translate certain of its existing practices under its RMS reliability criteria into regional Reliability Standards to supplement the continent-wide Reliability Standards. To that end, WECC established a task force to identify criteria in the RMS that should be binding on all BPS users, owners, and operators in the Western Interconnection, not just the Transmission Operators subject to the RMS. The task force chose eight of the identified criteria, which had the highest priority and could be implemented in the near term for translation into regional Reliability Standards.

The task force recommended the continued application of the Path OTC paradigm on the assumption that it would continue to provide an effective way to ensure that the system was operated within acceptable limits, consistent with the analysis tools available at that time. The primary processes and analysis tools that operators in the Western Interconnection used to achieve pre- and post-Contingency reliability at that time included: (1) offline studies performed by engineers; and (2) SCADA systems monitored by System Operators. At that time, state estimation, Real-time Contingency analysis, and other control room analysis tools more widely used today to assess conditions in the day-ahead time horizon and in Real-time were in their infancy and not generally used in operations in the Western Interconnection. Further, there was no continent-wide

¹² For example, a thermally limited OTC was a pre-determined WECC path transfer capability value that was intended to prevent an identified Contingency from causing exceedance of an identified Facility's thermal facility rating. A transient stability limited OTC was a pre-determined WECC path transfer capability value that was intended to prevent an identified Contingency from resulting in violation of WECC-established transient voltage dip criteria or transient frequency dip criteria.

requirement to conduct Operational Planning Analyses (“OPAs”) or Real-time Assessments (“RTAs”).

On March 26, 2007, NERC filed with FERC eight WECC regional Reliability Standards, including WECC-TOP-STD-007-0, based on the task force’s recommendation.¹³ Regional Reliability Standard WECC-TOP-STD-007-0 was a direct translation of the OTC reliability criteria from the RMS and identified 40 Transmission paths subject to the requirements therein. In its filing, NERC noted that WECC-TOP-STD-007-0 was more stringent than the corresponding continent-wide Reliability Standard TOP-007-0 in that the regional standard provided that any exceedances of OTC, regardless of whether there was also an applicable IROL designation, be addressed within 30 minutes (and 20 minutes for stability limited paths).

On June 8, 2007, FERC approved the eight WECC regional Reliability Standards as mandatory and enforceable in the Western Interconnection.¹⁴ FERC found that WECC-TOP-STD-007-0 met the criteria for regional Reliability Standards as it was more stringent than the corresponding continent-wide Reliability Standard TOP-007-0.¹⁵ FERC also directed modifications to WECC-TOP-STD-007-0 to address certain shortcomings with respect to formatting, aligning WECC regional definitions with the *NERC Glossary*, and removing compliance and measure references.¹⁶

In response to FERC’s directive and to make certain other changes, on April 7, 2009, NERC submitted a filing of regional Reliability Standard TOP-007-WECC-1, which was designed to replace and improve upon WECC-TOP-STD-007-0. In Order No. 752, issued on April 21, 2011,

¹³ *North American Electric Reliability Corporation, Request for Approval of Regional Reliability Standards of the Western Electricity Coordinating Council*, Docket No. RR07-11-000 (Mar. 26, 2007).

¹⁴ *North American Electric Reliability Corporation*, 119 FERC ¶ 61,260 (2007).

¹⁵ *Id.* at P 104.

¹⁶ *Id.* at P 110.

FERC approved TOP-007-WECC-1 and the retirement of WECC-TOP-STD-007-0.¹⁷ Regional Reliability Standard TOP-007-WECC-1 carries forward the operating paradigm from the RMS and WECC-TOP-STD-007-0 focused on identifying a single, pre-determined maximum transfer capability flow value for an entire Transmission path and requiring Transmission Operators to operate within that value to achieve reliable operations.¹⁸

Among other changes, TOP-007-WECC-1a uses the continent-wide *NERC Glossary* term “SOL” rather than the WECC regional term “OTC.” Although, as FERC recognized, those terms do not have a one-to-one relationship,¹⁹ the change in terminology was not intended to and did not substantively modify the obligation under the regional standard or existing practices in the Western Interconnection for establishing the single, pre-determined transfer value within which the 40 applicable Transmission paths must be operated.²⁰ As stated in Order No. 752, FERC initially questioned the appropriateness of the change in terminology:

In the NOPR, the Commission questioned the appropriateness of replacing the term “operating transfer capability” limit as used in the currently-effective Reliability Standard TOP-STD-007-0, with the term “SOL,” as used in TOP-007-WECC-1. The Commission stated that the term “SOL” is used within the Western Interconnection to refer to the facility or element that presents the most limiting of the prescribed operating criteria for the rated system path. Whereas, the OTC limit corresponds to the “maximum amount of actual power transferred over direct or parallel transmission elements from one transmission operator to another

¹⁷ *North American Electric Reliability Corporation*, Order No. 752, 135 FERC ¶ 61,062, 76 Fed. Reg. 23470 (2011). On June 18, 2014, FERC issued approved an interpretation to TOP-007-WECC-1, such that the numbering of the standard became TOP-007-WECC-1a. *N. Elec. Reliability Corp.*, Docket No. RD14-18-000 (June 18, 2014) (unpublished letter order).

¹⁸ Specifically, Requirement R1 of TOP-007-WECC-1 provides: “When the actual power flow exceeds an SOL for a Transmission path, the Transmission Operators shall take immediate action to reduce the actual power flow across the path such that at no time shall the power flow for the Transmission path exceed the SOL for more than 30 minutes.”

¹⁹ As noted above, OTC marries the concepts of transfer capability and operating limits, and, in that respect, more closely align with the *NERC Glossary* term “Total Transfer Capability” than the term “SOL.”

²⁰ Order No. 752 at PP 32-35.

transmission operator.” The Commission expressed concern that the terms SOL and OTC appear to measure different things.²¹

Nevertheless, FERC approved the change in response to WECC’s comments that the replacement of “OTC” with “SOL” was to address FERC’s concerns regarding the proliferation of regional terms and would not substantively change existing practices nor the manner in which the requirement would be enforced.²² WECC stated that the methodologies for establishing SOLs and OTCs in the Western Interconnection are the same and result in the same value.²³ As a result, OTCs became SOLs in the Western Interconnection.

In addition to the change in terms, TOP-007-WECC-1 extended the mitigation time for returning flows on stability limited paths to within the “Path SOL” from 20 minutes to 30 minutes. FERC approved the extension on the grounds that having a uniform time for both stability-limited and thermally-limited paths would reduce confusion among operators.²⁴

b. Legacy Operational Paradigm Reflected in TOP-007-WECC-1a

The Path OTC/SOL concept developed under the RMS and carried forward into WECC regional Reliability Standards TOP-STD-007-0 and, ultimately, TOP-007-WECC-1a, presumes an operational paradigm characterized by the following:

- A study, assessment, or analysis needs to be performed ahead of time to establish a Path OTC/SOL that achieves acceptable Bulk Electric System (“BES”) system performance.
- The established Path OTC/SOL (a maximum flow value on an interface or cut plane) is then communicated and coordinated with operators and other impacted entities prior to implementation.

²¹ Order No. 752 at P 32 (internal citations omitted).

²² Order No. 752 at P 35.

²³ The SOL methodology for the Western Interconnection developed pursuant to the Facilities Design, Connections, and Maintenance (“FAC”) group of Reliability Standards was consistent with the manner in which it calculated OTC under the RMS and WECC-TOP-STD-007-0.

²⁴ *Id.* at P 31.

- Transmission Operators are then given Operating Plans for operating below the Path OTC/SOL with the presumption that doing so will result in reliable operations.

More specifically, under this paradigm, Transmission Operators in the Western Interconnection, through their participation in sub-regional study groups, perform seasonal studies for each of the applicable Transmission paths to determine a Path SOL for use during the upcoming season. A primary objective of these seasonal studies is to confirm that the WECC Path Rating for each applicable path is achievable, given the expected system conditions for that season.²⁵ If the seasonal study demonstrates that the WECC Path Rating is achievable for that season, the WECC Path Rating becomes the Path SOL for the season. If the seasonal study shows that WECC Path Rating (plus some margin) is reached without encountering pre- or post-Contingency reliability issues, the Path is considered to be “flow limited” for that season and the “flow limited” WECC Path Rating serves as the seasonal Path SOL. If the seasonal study does not demonstrate that the WECC Path Rating is achievable for that season, the Transmission Operator determines, in accordance with the Reliability Coordinator’s SOL methodology under Reliability Standard FAC-011, a lesser Path flow value that provides for acceptable thermal, voltage, and stability criteria performance for the pre- and post-Contingency state. This value becomes the Path SOL for the season. The establishment of the Path OTC/SOL included Transfer Capability, scheduling limits, allocations, and commercial considerations.

As noted, once the seasonal Path SOL is established, it is communicated to Transmission Operators, along with an operating plan for operating below the Path SOL. The operating plan sets forth the steps operators must take to meet the 30-minute requirement in the event of an exceedance of the Path SOL. Throughout the season, the Transmission Operator may reduce the

²⁵ Each year WECC publishes the WECC Path Rating Catalog, which identifies ratings for all of the defined paths in WECC, not just the 40 paths subject to TOP-007-WECC-1a. The ratings are most closely related to a Total Transfer Capability, as defined in the *NERC Glossary*.

Path SOL as necessary based on their studies of anticipated outage conditions. Under TOP-007-WECC-1a, when the actual power flow on an applicable Transmission path exceeds its Path OTC/SOL in Real-time operations, operators must initiate actions, up to and including pre-Contingency load shedding, in accordance with the operating plan, to reduce that Path's flow below the Path SOL within 30 minutes.

To illustrate, WECC Path 30 (TOT 1A) – which is comprised of the following three transmission lines: (1) the Bears Ears-Bonanza 345 kV line, the Hayden-Artesia 138 kV line, and the Meeker-Rangely 138 kV line – currently has a Path SOL of 650 MW for flows going east to west. The 650 MW Path SOL is based on transfer studies indicating that if there is a Contingency outage of the Bears Ears-Bonanza 345 kV line when east to west flows on Path 30 (TOT 1A) exceed 650 MW, there is a significant risk that the Hayden-Artesia 138 kV line would exceed its emergency Facility Rating. As a result, a Path SOL of 650 MW was established to help ensure that a Contingency of the Bears Ears – Bonanza 345 kV line does not cause the Hayden – Artesia 138 kV line to exceed its emergency Facility Rating at that transfer level. Under TOP-007-WECC-1a, should flows on the Path exceed 650 MW, Transmission Operators must take action, up to and including load shedding, to reduce the flow below that level within 30 minutes, regardless of the results of Real-time Contingency analysis.

II. Purpose of Retirement of TOP-007-WECC-1a

The purpose of the proposed retirement of TOP-007-WECC-1a, along with the planned modifications to Peak's SOL methodology, is to move away from the historical Path SOL paradigm, decoupling operating limits and transfer capability, and allow entities in the Western Interconnection to align their operating practices with the framework established in the revised TOP/IRO Reliability Standards approved in Order No. 817. As discussed below, the use of the Path OTC/SOL paradigm, unique to the Western Interconnection, has not always provided an

optimal framework for reliably operating the BPS and is not necessary for reliable operations. As recognized in Order No. 817, the revised TOP/IRO Reliability Standards – which are focused on identifying SOLs and IROLs on a facility-by-facility basis (as opposed to an entire Transmission path) and using OPAs and RTAs to assess conditions and identify expected or actual SOL or IROL exceedances – provide a comprehensive approach to achieving the objective of operating within acceptable pre- and post-Contingency reliability criteria.²⁶ The retirement of TOP-007-WECC-1a and alignment with the continent-wide TOP/IRO Reliability Standards would help ensure that SOLs are developed for each BES facility that comprise the 40 applicable Transmission paths and that those SOLs (and any IROLs) accurately reflect Real-time operating limits. The retirement will also avoid duplication and potential confusion upon the effective date of the revised TOP/IRO standards stemming from the disparate operating paradigms reflected in TOP-007-WECC-1a and the revised TOP/IRO standards.

a. The Operational Paradigm Reflected in TOP-007-WECC-1a Does Not Provide an Optimal Framework for Reliable Operations

As noted above, given the analysis tools available at the time the RMS was first developed, the presumption was that operating within the Path OTC/SOL would result in acceptable system performance for the pre- and post-Contingency operating states and an efficient use of the Transmission system. That has not always been the case. The application of the Path SOL construct has not always resulted in Path SOL values that represented the appropriate limits for reliably operating the facilities comprising the Transmission paths given existing conditions (i.e., the Path SOL value did not provide for acceptable performance pre- and post-Contingency). As acknowledged in the joint FERC-NERC report titled *Arizona-Southern California Outage on*

²⁶ Order No. 817 at PP 16-17.

September 8, 2011, Causes and Recommendations (the “Southwest Outage Report”), the September 8, 2011 event in the Southwest occurred even though the facilities on the relevant Transmission paths were operated within their pre-determined Path SOLs.²⁷ While Transfer Capability values reflected in the Path SOL are appropriate for determining scheduling limitations, using these pre-determined Transfer Capability values as Real-time operating limits poses significant reliability gaps.

At the other end of the spectrum, the use of a pre-determined OTC/SOL for an entire path as contemplated under TOP-007-WECC-1a and Peak’s SOL methodology has not always resulted in an efficient use of the Transmission system. There have been instances where actual flows exceeded the Path SOL and the requirements of TOP-007-WECC-1a necessitated that entities take extreme and disruptive actions to reduce the flow, such as pre-Contingency load shedding, even though Real-time analysis did not confirm the presence of an actual reliability issue. In such circumstances, TOP-007-WECC-1a prevented operators in the Western Interconnection from efficiently and reliably operating the system based on Real-Time analysis.

Following the Southwest Outage Report and with the proliferation of advanced applications, such as state estimation and Real-time Contingency analysis, entities in the Western Interconnection have come to understand that reliance on a single pre-determined Path SOL value may not always provide reasonable assurance of reliable operations. As a result and consistent with the findings and recommendations of the Southwest Outage Report, entities in the Western Interconnection have been making changes in their operating practices to improve reliability, including, among other things, increased reliance on day-ahead and Real-Time Assessments of

²⁷ FERC and NERC, *Arizona-Southern California Outage on September 8, 2011, Causes and Recommendations* (Apr. 27, 2012), at 99-100, available at <http://www.ferc.gov/legal/staff-reports/04-27-2012-ferc-nerc-report.pdf>.

operating conditions, and to differentiate between Real-time operating limits and transfer capability. As part of that transition, entities in the Western Interconnection are seeking to move away from the historical, path-centric paradigm unique to the Western Interconnection and align their practices with the framework in the revised continent-wide TOP/IRO Reliability Standards by, among other things, (1) modifying Peak’s SOL methodology to establish SOLs for each BES Facility, not entire Paths, based on Facility Ratings, voltage limits, and stability limits, and (2) retiring regional Reliability Standard TOP-007-WECC-1a.²⁸

b. The Revised TOP/IRO Standards Provide a More Efficient and Effective Framework for Operating the BPS Within Acceptable Pre- and Post-Contingency Criteria

In contrast to the operational paradigm in TOP-007-WECC-1a, as FERC recognized in Order No. 817, the revised TOP/IRO Reliability Standards provide a “comprehensive framework as well as important improvements to ensure that the bulk electric system is operated within pre-established limits while enhancing situational awareness and strengthening operations planning.”²⁹ Additionally, FERC stated that the revised TOP/IRO Reliability Standards “address the coordinated efforts to plan and reliably operate the bulk electric system under both normal and abnormal conditions.”³⁰

The continent-wide revised TOP/IRO Reliability Standards reflect, in large measure, the operating paradigm contemplated by the Southwest Outage Report.³¹ The TOP/IRO Reliability

²⁸ Entities in the Western Interconnection would continue to use Transfer Capability values that respect SOLs for purposes of scheduling transmission service but, for the reasons stated above, would no longer combine transfer limits and operating limits into a single, pre-determined value for measuring reliable operation on an entire Transmission path.

²⁹ Order No. 817 at 14.

³⁰ *Id.*

³¹ As FERC recognized, the revisions to the TOP/IRO standards and the definitions of OPA and RTA addressed multiple recommendations in the Southwest Outage Report. Order No. 817 at P 17.

Standards approved in Order No. 817 contemplate SOLs and IROLs as dynamic values reflecting Facility Ratings, voltage limits, transient Stability limits, and voltage Stability limits, determined for each BES facility based on assessments of expected or actual conditions to ensure acceptable performance pre- and post-Contingency.³² The use of a single pre-determined Path SOL value, as reflected in TOP-007-WECC-1a and Peak’s current SOL methodology, is not consistent with the framework contemplated in the revised TOP/IRO Standards and exists only in TOP-007-WECC-1a as a legacy of an operating paradigm established in the late 1990s. As stated in the whitepaper titled “System Operating Limit Definition and Exceedance Clarification” (the “SOL Whitepaper”)

³³ underpinning the development of the revised TOP/IRO Reliability Standards:

Some have interpreted the language in approved FAC-011-2, Requirement R2 to imply that the objective is to perform prior studies to determine a specific MW flow value (SOL) that ensures operation within the criteria specified in approved FAC-011-2, Requirement R2 sub-requirements, the assumption being that if the system is operated within this pre-determined SOL value, then all of the pre- and post-Contingency requirements described in approved FAC-011-2, Requirement R2 will be met. The SDT believes this approach may not capture the complete intent of the SOL concept within approved FAC-011-2, which is both:

1. Know the Facility Ratings, voltage limits, transient Stability limits, and voltage Stability limits, and
2. Ensure that they are all observed in both the pre- and post-Contingency state by performing a Real-time Assessment.

SOLs are based on Normal and Emergency (short-term) Facility Ratings, voltage limits, transient Stability limits, and voltage Stability limits – *any of which can be the most restrictive limit at any point in time pre- or post-Contingency*. For example, if an area of the BES is at no risk of encroaching upon Stability or voltage limitations in the pre- or post-Contingency state, and the most restrictive limitations in that area are pre- or post-Contingency exceedance of Facility Ratings, then the thermal Facility Ratings in that area are the most limiting SOLs. Conversely, if an

³² Order No. 817 at P 16 (recognizing that “the TOP/IRO Standards approved [in Order No. 817] address the possibility that additional SOLs could develop or occur in the same-day or Real-Time operational time horizon and, therefore, would pose an operational risk to the interconnected transmission network if not addressed.”).

³³ The SOL Whitepaper is available at http://www.nerc.com/pa/Stand/Prjct201403RvsnstoTOPandIROStndrds/2014_03_fifth_posting_white_paper_sol_exceedance_20150108_clean.pdf.

area is not at risk of instability and no Facilities are approaching their thermal Facility Ratings, but the area is prone to pre- or post-Contingency low voltage conditions, then the voltage limits in that area are the most limiting SOLs.³⁴

Based on this understanding of SOLs, the TOP/IRO Reliability Standards approved in Order No. 817 set forth requirements for operating within SOLs and IROLs, focusing on the use of OPAs and RTAs to assess conditions and identify the relevant SOLs and IROLs for each BES facility and any expected or actual exceedances of those limits. Specifically, during the operations planning time horizon, Reliability Coordinators and Transmission Operators must perform OPAs to assess whether the planned operations for the next-day will exceed SOLs (and IROLs for the Reliability Coordinator) within their area.³⁵ If the OPA identifies any potential exceedances, the Reliability Coordinator and Transmission Operator must have an Operating Plan to address the exceedance.³⁶ In Real-time, Reliability Coordinators and Transmission Operators must perform RTA every 30 minutes to determine whether there are any expected or actual exceedances of SOLs (and IROLs for the Reliability Coordinator) based on Real-time conditions.³⁷ If the RTA identifies any such exceedances, the Reliability Coordinator and Transmission Operator must initiate its Operating Plan to mitigate the SOL exceedance.³⁸ If there is an expected or actual IROL exceedance identified in the RTA, the exceedance must be resolved within the IROL T_v , which can be no longer than 30 minutes.³⁹

The WECC Path 30 (TOT 1A) example, discussed above, helps illustrate the need to retire TOP-007-WECC-1a. As described above, WECC Path 30 (TOT 1A) currently has a Path SOL of

³⁴ SOL Whitepaper at 3 (emphasis added).

³⁵ IRO-008-2, Requirement R1; TOP-004-2, Requirement R1.

³⁶ IRO-008-2, Requirement R2; TOP-004-2, Requirement R2.

³⁷ IRO-008-2, Requirement R4; TOP-001-3, Requirement R13.

³⁸ IRO-008-2, Requirement R5; TOP-001-3, Requirement R14.

³⁹ IRO-009-2, Requirements R1-R4; TOP-001-3, Requirement R12.

650 MW for flows going east to west based on transfer studies indicating that a Contingency of the Bears Ears – Bonanza 345 kV line may cause the Hayden – Artesia 138 kV line to exceed its emergency Facility Rating at transfer levels exceeding 650 MW. As a result of these studies, the relevant entities in the Western Interconnection monitor for that Contingency in their Real-time Contingency analysis. If TOP-007-WECC-1a is not retired, Transmission Operators may be required to monitor the Bears Ears – Bonanza 345kV line Contingency under two conflicting paradigms.

Under the revised TOP/IRO Reliability Standards, Transmission Operators and Peak, as the Reliability Coordinator, would (1) perform OPAs and RTAs to determine, among other things, if conditions are such that the loss of the Bears Ears – Bonanza 345kV line were to cause the Hayden – Artesia 138 kV line to exceed its emergency Facility Rating and, (2) if so, take action to mitigate that SOL exceedance in accordance with the applicable Operating Plan. If the emergency Facility Rating for the Hayden – Artesia line were also designated as an IROL, the mitigating actions would have to occur with IROL T_v .

NERC understands that it is possible for Real-time Contingency analysis to show that even if flows on the Transmission path exceeded the 650 MW Path SOL, the expected or actual operating conditions may be such that a Contingency of the Bears Ears – Bonanza 345kV line would not cause the Hayden – Artesia 138 kV line to exceed its emergency Facility Rating at the time. Conversely, NERC understands that it is also possible for Real-time Contingency analysis to show that even if flows were below the 650 MW Path SOL, the conditions may be such that a Contingency of the Bears Ears – Bonanza 345kV line would cause the Hayden – Artesia 138 kV line to exceed its emergency Facility Rating at the time. Under the revised TOP/IRO Reliability Standards, the assessment of conditions through OPAs and RTAs would show whether the SOL

for the Hayden – Artesia 138 kV line would actually be exceeded as a result of the that Contingency and the relevant entities would be required to act to maintain reliability in their areas under Reliability Standards IRO-001-4, Requirement R1 and TOP-001-3, Requirement R1.

In contrast, under TOP-007-WECC-1a, the results of OPAs and RTAs are irrelevant. Should flows on WECC Path 30 (TOT 1A) exceed 650 MW, Transmission Operators must take action, up to and including load shedding, to reduce the flow below that level within 30 minutes, regardless of whether Real-Time Contingency analysis identifies an expected or actual exceedance of the emergency Facility Rating for the Hayden – Artesia 138 kV line. On the other hand, if Real-Time Contingency analysis identifies that such an SOL exceedance is expected to occur or is actually occurring in Real-time even if flows were below 650 MW, TOP-007-WECC-1a would not require any action because the Path SOL is not exceeded. In short, under TOP-007-WECC-1a, entities in the Western Interconnection may be required to take mitigating action (redispatching generation, curtailing schedules, and even shedding load) when Real-time tools indicate that no action is necessary. In other circumstances, TOP-007-WECC-1a would not require any mitigating action when Real-time tools indicates a potential or actual reliability issue (i.e., the use of Path SOLs could sometimes mask actual reliability problems).⁴⁰

Given the requirements in the revised TOP/IRO Reliability Standards, the question is whether there is any continuing reliability need to monitor and address the Bears Ears – Bonanza 345kV line Contingency under the TOP-007-WECC-1a paradigm and risk operator confusion as to the appropriate operating limit for Real-time operations. As the example above highlights, as compared to the legacy practices reflected in TOP-007-WECC-1a, the framework established in

⁴⁰ Of course, if Real-time analysis indicates a potential or actual reliability issue, Transmission Operators would take action to address the issue, in accordance with the continent-wide standards.

the revised TOP/IRO standards provides for a more efficient and accurate mechanism to identify and respond to potential reliability issues. As FERC acknowledged in Order No. 817 and as discussed in greater in the following sections, the revised TOP/IRO Reliability Standards “provide *a comprehensive framework...to ensure that the bulk electric system is operated within pre-established limits while enhancing situational awareness and strengthening operations planning.*”⁴¹ There is no reliability need to continue the historical, path-centric approach reflected in TOP-007-WECC-1a or to treat the facilities comprising the 40 Transmission paths subject to TOP-007-WECC-1a any differently than all other facilities are treated under the continent-wide TOP/IRO Reliability Standards. Each of the facilities comprising the 40 Transmission paths would be monitored in accordance with the TOP/IRO Reliability Standards and subject to associated mitigation requirements should there be an expected or actual exceedance of an SOL or IROL on those facilities.

III. Application of the Revised TOP/IRO Reliability Standards to the 40 Transmission Paths

The remainder of this Supplement discusses manner in which the reliability of the 40 Transmission paths currently subject to TOP-007-WECC-1a is addressed under the revised TOP/IRO Reliability Standards. This section is organized as follows:

- Section III.a explains the manner in which the 40 Transmission paths subject to TOP-007-WECC-1a would be monitored under the continent-wide TOP and IRO Reliability Standards.
- Section III.b discusses whether the 30-minute mitigation requirement in TOP-007-WECC-1a would continue to apply to the 40 Transmission paths following retirement.
- Section III.c discusses the manner in which SOLs and IROLs are established for each of the facilities comprising the 40 Transmission paths and the types of limitations associated with those paths.

⁴¹ Order No. 817 at 14 (emphasis added).

- Section III.d discusses Peak’s intent to modify its methodology for establishing SOLs and IROLs and the manner in which such revisions could impact the evaluation of the 40 Transmission paths.
- Section III.e discusses Peak’s use of a 1000 MW threshold in its current methodology for determining IROLs and its application to the 40 Transmission paths.
 - a. Each of the Facilities Comprising the 40 Transmission Paths Must be Monitored Under the Continent-wide TOP/IRO Reliability Standards to Help Ensure Reliable Operation

Upon the retirement of regional Reliability Standard TOP-007-WECC-1a and the modifications to Peak’s SOL methodology, Transmission paths in the Western Interconnection would no longer have a single, uniquely monitored Path SOL.⁴² Instead, each facility comprising the 40 Transmission paths would be separately monitored in accordance with the requirements in the continent-wide TOP-IRO Reliability Standards. With respect to monitoring those facilities, the TOP/IRO Reliability Standards affirmatively obligate Transmission Operators and Reliability Coordinators to monitor facilities in their areas to ensure they have the necessary situational awareness to maintain reliable operations, as follows:

- TOP-001-3, Requirement R10 requires each Transmission Operator to perform the following as necessary for determining SOL exceedances within its Transmission Operator Area: (1) within its Transmission Operator Area, monitor Facilities and the status of Special Protection Systems, and (2) outside its Transmission Operator Area, obtain and utilize status, voltages, and flow data for Facilities and the status of Special Protection Systems.
- IRO-002-4, Requirement R11 obligates Reliability Coordinators to monitor Facilities, the status of Special Protection Systems, and non-BES facilities identified as necessary by the Reliability Coordinator, within its Reliability Coordinator Area and neighboring Reliability Coordinator Areas to identify any SOL exceedances and to determine any IROL exceedances within its Reliability Coordinator Area.

⁴² The only exception would be if the Transmission path is directly associated with an identified and monitored stability limit.

With two exceptions, the facilities comprising each of the 40 paths subject TOP-007-WECC-1a are designated as BES facilities.⁴³ Under IRO-002-4, Requirement R11, the Reliability Coordinator is responsible for monitoring both BES Facilities and non-BES facilities that have an impact on the BES. Further, in accordance with directives in order No. 817, NERC is developing modifications to TOP-001-3, Requirement R10 to require Transmission Operators to also monitor non-BES facilities that could adversely impact BPS reliability. Accordingly, each of the facilities comprising the 40 Transmission paths, including non-BES facilities, would be subject to these monitoring requirements to ensure, among other things, that the facilities are operated within their SOLs and IROLs. In addition, as discussed above, the facilities comprising the 40 Transmission paths would be evaluated in OPAs and RTAs.⁴⁴

To ensure that Reliability Coordinators and Transmission Operators have the data necessary to perform their OPAs, RTAs, and Real-time monitoring obligations, the TOP/IRO Reliability Standards (IRO-010-2 and TOP-003-3) establish requirements for the provision of information and data, including non-BES data, needed by Transmission Operators and Reliability Coordinators to fulfill their planning and operational responsibilities. Under Reliability Standards IRO-008-2 and TOP-003-3, Reliability Coordinators and Transmission Operators would collect information and data pertaining to the facilities comprising the 40 Transmission paths to help maintain situational awareness and reliable operations.

⁴³ The two facilities that do not meet the BES definition are (1) Dry Gulch 115/69-kV transformer – Path 6 – West of Hatwai, and (2) Drum-Summit 60-kV line – Path 24 – PG&E-Sierra.

⁴⁴ In performing OPAs and RTAs, entities must consider the following inputs: load forecasts, generation output levels, Interchange, known Protection System and Special Protection System status or degradation, Transmission outages, generator outages, Facility Ratings, and identified phase angle and equipment limitations

b. Each of the Facilities Comprising the 40 Transmission Paths Would be Subject to Mitigation Requirements under the Continent-wide TOP and IRO Reliability Standards Designed to Ensure Reliable Operations

Regional Reliability Standard TOP-007-WECC-1a establishes a 30-minute mitigation period for all exceedances of Path SOLs, regardless of risk to the BPS. As described above, the application of the 30-minute mitigation requirement to all Path SOLs is a legacy of the RMS program.⁴⁵ WECC is not aware of any specific technical studies or analysis supporting application of the 30-minute mitigation time to each Path SOL; instead, the 30-minute period seems to have originated as an agreement between participants in the RMS that 30 minutes represents a reasonable amount of time to require Transmission Operators to return flow on the path to within the Path OTC/SOL.

In contrast, the revised TOP/IRO Reliability Standards do not create a uniform timeframe for addressing all SOL or IROL exceedances; instead, those standards create a risk-based framework for addressing SOL and IROL exceedances. As discussed below, depending on risk to the BPS, the required mitigation period could be less than 30 minutes and, in other cases, be greater than 30 minutes.

The revised TOP/IRO Reliability Standards establish the following requirements in the day-ahead time frame for mitigating potential SOL and IROL exceedances:

- Each Transmission Operator is required to conduct an OPA to assess whether its planned operations for the next day will exceed any of its SOLs. (TOP-001-3, Requirement R1).
- Similarly, each Reliability Coordinator is required to conduct an OPA to assess whether its planned operations for the next day will exceed any SOLs and IROLs within its Wide Area. (IRO-008-2, Requirement R1).
- If the Transmission Operator's OPA identifies any potential SOL exceedances, the Transmission Operator must: (1) have an Operating Plan to mitigate that exceedance; (2)

⁴⁵ As discussed above, the RMS originally required mitigation within 20 minutes for stability limited paths or for more than 30 minutes for thermally limited paths. The mitigation timeframe was modified to 30 minutes for all Path SOLs with the approval of TOP-007-WECC-1a.

notify entities identified in the Operating Plan as to their role under those plans; and (3) provide its Operating Plan for next-day operations to its Reliability Coordinator. (TOP-001-3, Requirements R2, R3 and R6). The Operating Plan must include specific plans/strategies to prevent an SOL exceedance (i.e., pre-Contingency actions) or mitigate the impact of the SOL exceedance (i.e., post-Contingency actions). The Operating Plan must contain appropriate timeframes for initiating the actions required under the plan to maintain reliable operations and/or return the system to within applicable SOLs.

- If the Reliability Coordinator's OPA identifies any potential SOL or IROL exceedances, the Reliability Coordinator must: (1) have a coordinated Operating Plan for next day operations to address the potential exceedances, which considers the Operating Plans provided by its Transmission Operators; and (2) notify other impacted entities of their role under the plan. (IRO-008-2, Requirements R2 and R3).
- Additionally, for each IROL that the Reliability Coordinator identifies one or more days prior to the operating day, the Reliability Coordinator must have one or more Operating Processes, Procedures, or Plans that identify actions the Reliability Coordinator shall take or actions the Reliability Coordinator shall direct others to take (up to and including load shedding) that can be implemented in time to prevent the identified IROL exceedance and to mitigate the magnitude and duration of an IROL exceedance such that the IROL exceedance is relieved within the IROL's T_v , which is defined as the maximum time, not to exceed 30 minutes, that an IROL can be violated before the risk to the interconnection or other Reliability Coordinator Area(s) becomes greater than acceptable. (IRO-009-2, Requirement R1).

For the operating day, the revised TOP/IRO Reliability Standards establish the following requirements for mitigating expected or actual SOL and IROL exceedances:

- Each Transmission Operator must perform an RTA every 30 minutes to assess conditions and determine whether there are any actual or expected SOL exceedances. (TOP-001-3, Requirement R13).
- The Reliability Coordinator must also perform an RTA every 30 minutes to assess conditions and determine whether there are any actual or expected SOL or IROL exceedances. (IRO-008-2, Requirement R4).
- If the results of its RTA indicates an actual or expected condition that results in, or could result in, a SOL or IROL exceedance within its Wide Area, the Reliability Coordinator shall notify impacted Transmission Operators and Balancing Authorities within its Reliability Coordinator Area, and other impacted Reliability Coordinators as indicated in its Operating Plan. (IRO-008-2, Requirement R5).
- Further, the Transmission Operator must initiate its Operating Plan to mitigate a SOL exceedance identified as part of its Real-time monitoring or RTA and inform its Reliability Coordinator of actions taken to return the System to within limits when a SOL has been exceeded. (TOP-001-3, Requirement R1).

- Given the more severe impact of IROL exceedances, the Transmission Operator is prohibited from operating outside any IROL for a continuous duration exceeding its associated IROL T_v . (TOP-001-3, Requirement R1).
- Additionally, for expected or actual IROL exceedances identified through its Real-time monitoring or RTA, the Reliability Coordinator must (1) initiate one or more Operating Processes, Procedures, or Plans to prevent an expected IROL exceedance; and (2) act or direct others to act so that the magnitude and duration of an actual IROL exceedance is mitigated within the IROL's T_v . (IRO-009-2, Requirements R2 and R3).

Under this framework, the applicable mitigation period depends on whether the SOL is also designated as an IROL and the facts and circumstances presented by the exceedance. Given the increased severity of adverse reliability impact of an IROL exceedance, the maximum period allowed for operating outside an IROL is 30 minutes, as described above. The application of IROL T_v , however, could result in a mitigation period of less than 30 minutes as, in some cases, the risk to the Interconnection or other Reliability Coordinator Areas would become greater than acceptable within 5-10 minutes of the IROL exceedance or even immediately. As such, under the Revised TOP/IRO Reliability Standards, upon the retirement of TOP-007-WECC-1a, if any facilities comprising the 40 applicable Transmission paths has an IROL, the mitigation period for exceedances of that IROL would be equivalent to the time provided in TOP-007-WECC -1a for Path SOL exceedances, if not less.

For (non-IROL) SOL exceedances, the revised TOP/IRO Reliability Standards recognize that a maximum mitigation period applicable to all SOL exceedances is not necessary or prudent as the mitigation period should depend on the potential impact of that exceedance over time. The TOP/IRO Reliability Standards thus provide Reliability Coordinators and Transmission Operators the flexibility to determine the appropriate mitigation time periods. As described above, when there is an SOL exceedance in Real-time, the Transmission Operator is required to implement mitigating strategies consistent with its Operating Plan. Operating Plans can include specific Operating Procedures or more general Operating Processes and should include both pre- and post-

Contingency mitigation plans/strategies. As described in the SOL Whitepaper, Operating Plans must include appropriate timelines to escalate the level of mitigating plans/strategies to ensure acceptable BES performance is maintained and prevent SOL exceedances from becoming an IROL exceedance.⁴⁶ As such, an Operating Plan must include the appropriate time element to return the system to within acceptable Normal and Emergency (short-term) Ratings and/or operating limits.

The timeframes set forth in the Operating Plan could require action in less than 30 minutes or greater than 30 minutes, depending on the facts and circumstances. For instance, depending on the time-value rating of the facility, the Operating Plan could lay out certain actions to be taken prior to the exceedance, within five minutes of the exceedance, and within 30 minutes, within 60 minutes if the problem was not resolved. Ultimately, however, Reliability Standards IRO-001-4, Requirement R1 and TOP-001-3, Requirement R1 create affirmative obligations for Reliability Coordinators and Transmission Operators, respectively, to act to maintain the reliability of their area via their own actions or by issuing Operating Instructions. As a result, should an entity's Operating Plan fail to require action in timely manner so as to maintain reliability in its area, it risks violating those requirements.

Upon the effective date of the revised TOP/IRO Standards and the retirement of TOP-007-WECC-1a, Reliability Coordinators and Transmission Operators would be subject to these mitigation requirements for all BES facilities in the Western Interconnection, including those comprising each of the 40 Transmission paths currently subject to TOP-007-WECC-1a. Additionally, under the FAC Reliability Standards, Peak, as the Reliability Coordinator for the Western Interconnection (except Alberta, Canada), is obligated to determine which SOLs for the facilities comprising the 40 Transmission paths, as well as any others in the Western

⁴⁶ SOL Whitepaper at 7-8.

Interconnection, would meet the criteria for an IROL designation such that a maximum 30-minute time period would continue to apply to those facilities upon the retirement of TOP-007-WECC-1a. Any failure to properly designate IROLs may be a violation of requirements in the FAC Reliability Standard (FAC-014-2).

In deciding to move away from the historical approach reflected in TOP-007-WECC-1a, WECC did not identify any reliability need to continue the Path SOL paradigm and treat the facilities comprising the 40 applicable Transmission paths any differently from any other BES facility. The 40 paths subject to TOP-007-WECC-1a were originally selected for different treatment as part of the RMS in the late 1990s. There are no records of any technical studies or analysis to document the criteria under which the paths were chosen for inclusion in the RMS. The identification of the 40 Transmission paths seems to have been an attempt to capture many of the high-voltage transmission lines between the historical WSCC control areas. Similarly, as noted above, application of the 30-minute mitigation period to all exceedances of Path SOLs seems to be a remnant of an agreement as to a reasonable, uniform time period for mitigating action rather than an analysis of the reliability effects of such exceedances.

c. SOLs and IROLs, Where Applicable, Must be Established for Each of the Facilities Comprising the 40 Transmission Paths in Accordance with Peak's SOL Methodology

As described above, under the revised TOP/IRO Reliability Standards, all BES facilities must be operated within SOLs and, as applicable, IROLs. In accordance with the requirements of the FAC Reliability Standards, Transmission Operators must, consistent with their Reliability Coordinator's SOL methodology, establish SOLs for each of their BES facilities. Additionally, the Reliability Coordinator must determine which of those SOLs warrant designation as an IROL. As contemplated in the FAC and TOP/IRO standards, SOLs and IROLs are determined based on seasonal studies, outage coordination studies, OPAs, and RTAs. As noted above, certain SOL

values are dynamic, reflecting changing operating conditions. Similarly, an SOL may become an IROL when certain conditions are present but not under other conditions.

As contemplated in Peak's document outlining expected modifications to its SOL methodology ("Draft SOL Methodology Document"), posted to its website on September 9, 2016, all BES Facilities in the Western Interconnection, including those that comprise the 40 Transmission paths currently subject to TOP-007-WECC-1a, would be monitored in the operations time horizon for pre- and post-Contingency performance in an iterative fashion as Real-time approaches: first via seasonal assessments, then through the IRO-017 outage coordination process studies, followed by OPAs, and finally through RTAs.⁴⁷ For each of these iterative steps, Transmission Operators will determine whether Facility Ratings or system voltage limits would be expected to be exceeded in the pre- or post-Contingency state, or whether any instability risks would need to be addressed via established stability limits. In studying the system and assessing conditions for determining SOLs, Transmission Operators would be responsible under Peak's expected SOL methodology for stressing the system, identifying any instability risks, and determining the extent to which transmission interfaces and load areas should be stressed in identifying stability SOLs. Although the extent to which the system should be stressed depends on a variety of factors, to accurately determine stability SOLs, the system should be stressed up to, and slightly beyond, reasonable maximum stressed conditions. Any stability limitation that results from studies would be identified as an SOL.

Peak's SOL Methodology would then be applied to determine whether any of the SOLs qualify as an IROL. NERC understands that Peak currently monitors three IROLs in its area and

⁴⁷ The Draft SOL Methodology Document is available at: <https://www.peakrc.com/whatwedo/sol/Pages/default.aspx>.

is continuously performing studies to identify other limits that may qualify as IROLs. Peak reviews studies performed by Planning Coordinators, seasonal studies performed by sub-regional study groups, and outage studies and OPAs performed by Transmission Operators to determine the existence of IROLs. Peak also collaborates with Transmission Operators to identify additional risks in the system for instability or potential Cascading in Real-time operations. If any of these analyses reveals risks associated with instability, Cascading, or uncontrolled separation, these risks would be addressed via IROLs as appropriate per Peak's SOL Methodology.

As it relates to establishing SOLs and IROLs, Peak conducted an examination of the 40 Transmission paths to understand and document the type of limitation associated with each of the paths. Attachment A hereto provides the results of that investigation so as to provide additional information about the 40 Transmission paths and the types of issues entities in the Western Interconnection currently monitor. The information in Attachment A is based on data from planning studies that established the WECC Path Rating and Transmission Operator reports since January 2015. Peak noted that the limitations on these paths change based on Transmission Operator assessments of anticipated operating conditions, including Facility outages. Peak's objective in gathering this information was to identify paths that were flagged as being transient stability limited or voltage stability limited since January 1, 2015 and for use in its determinations of whether any of these limitations warrant an IROL designation going forward.

The following are some key observations from the data in the attachment:

- Of the 40 Transmission paths, only two were identified as being limited by transient stability or voltage stability. One of the two stability limits has already been designated as an IROL (i.e., the NW Washington IROL).
- 25 Transmission paths are thermally limited.
- 15 of the Transmission paths are thermally based proxy limits (i.e., limitations placed on the path to address a post-Contingency thermal limit exceedance on a non-Path Facility).

- Three of the Transmission paths are limited by steady state voltage, voltage dip criteria, or voltage deviation.
 - Six of the Transmission paths are combinations of thermally limited or voltage limited depending on either direction of flow or season.
 - The limitation on 16 Transmission paths is established by multiple contingency events.
- d. The Expected Modifications to Peak's SOL Methodology are Designed to Ensure that SOLs and IROLs are Developed Consistent with the Framework Established in the Revised TOP/IRO Standards

As noted in the Filing, NERC and WECC understand that Peak expects to issue a revised SOL methodology as part of the transition away from the path-centric paradigm, with an effective date of April 1, 2017. The April 1, 2017 effective date is designed to coincide with the effective date of the revised TOP/IRO Reliability Standards. Consistent with the proposed retirement of TOP-007-WECC-1a, under the revised SOL methodology, NERC and WECC understand that SOLs for the 40 Transmission paths subject to TOP-007-WECC-1a will no longer reflect a single pre-determined value for the entire path. Instead, as discussed above, the SOL methodology would focus on determining SOLs on a facility-by-facility basis and reflect Facility Ratings, system voltage limits, and stability limitations used in operations.

Peak's Draft SOL Methodology Document describes the manner in which BES facilities in the Western Interconnection, including facilities comprising the 40 Transmission paths will be evaluated for SOL and IROL designations. As discussed therein and as noted above, for stability limitations, Transmission Operators are required to stress the system to determine the existence of any stability limitations. When stability limitations are established, they must be established in a manner that most accurately and directly addresses the instability risk, and they must be established on an interface that most accurately and directly monitors the instability risk. Accordingly, stability limitations may or may not coincide with defined WECC Paths. Neither historical presumptions/practices regarding system monitoring nor commercial/contractual arrangements

should influence where stability limitations are most accurately established and monitored for reliability. Additionally, Facility Ratings and system voltage limits will be monitored for the pre- and post-Contingency state as SOLs, and any identified stability limitations will be monitored as SOLs (or IROLs, if applicable).

e. The Expected Modifications to Peak’s SOL Methodology Would Eliminate the 1,000 MW Threshold for Determining IROLs

As FERC noted in Order No. 817, Peak’s SOL methodology currently includes a 1,000 MW threshold as part of its IROL determinations.⁴⁸ NERC and WECC understand that as part of its modifications to its SOL methodology, Peak expects to remove the 1,000 MW criteria. NERC and WECC understand that Peak’s revised SOL methodology would contain a description of instability, Cascading, and uncontrolled separation that necessitate the need to establishing an SOL as an IROL without use of a load loss threshold. Accordingly, the 1,000 MW threshold would not be applied to the facilities comprising the 40 Transmission paths upon the issuance of the modified SOL methodology, which is expected to occur on the proposed effective date of the new TOP/IRO Reliability Standards and the proposed retirement of TOP-007-WECC-1a. In any event, the specifics related to Peak’s SOL methodology and the appropriate designation of IROLs is a matter of compliance with Reliability Standard FAC-011-2 and should not affect the analysis of whether regional Reliability Standard TOP-007-WECC-1a should be retired.

⁴⁸ Order No. 817 at P 27.

Respectfully Submitted

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Date: November 21, 2016

Attachment A



Peak Reliability performed an investigation of each of the paths listed in the TOP-007-WECC-1a “Major WECC Transfer Paths in the Bulk Electric System”. The investigation examined the 2016 WECC Path Rating Catalog as well as TOP-provided Path Reports submitted since January 1, 2015. The objective of this investigation was to understand and document the type of limitation associated with each of the TOP-007-WECC-1a Paths.

The WECC Path Rating Catalog provides a description of the type of limitation associated with each path based on the planning studies that established the WECC Path Rating.

Per Peak’s current SOL Methodology for the Operations Horizon and Peak’s IRO-010 Data specification, TOPs are required to provide Peak with a daily Path Report for each of the WECC Paths, including the TOP-007-WECC-1a Paths. The Path Report identifies the type of limitation for each path (thermal, voltage, transient stability, voltage stability) and any relevant transmission or generation facility outage that is associated with that limitation. The limitation on these Paths change frequently based on TOP assessments of anticipating operating conditions, including Facility outages. Peak’s objective was to identify Paths that were flagged as being transient stability limited or voltage stability limited since January 1, 2015.

The results of the investigation are captured in the attached spreadsheet. A few key observations can be gleaned from the data:

1. Of the 40 Paths listed in the “Major WECC Transfer Paths in the Bulk Electric System”, only two Paths were identified as being limited by transient stability or voltage stability. One of the two stability limited Paths is addressed via the NW Washington IROL currently in place.
2. Twenty seven Paths are strictly thermally limited.
3. Fifteen of the Path limitations are thermally based proxy limits – these are limitations placed on the Path to address a post-Contingency thermal limit exceedance on a non-Path Facility.
4. Three Paths are limited by steady state voltage, voltage dip criteria, or voltage deviation.
5. Six Paths are combinations of thermally limited or voltage limited depending on either direction of flow or season.
6. Sixteen Paths have the limit established by multiple contingency events.

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Peak's next steps are to perform a more thorough investigation of Path 1 which is limited by frequency performance within AESO. Peak will collaborate with the TOPs associated with that Path to determine if an IROL should be established.

Peak intends to continue to monitor all BES Facilities for pre- and post-Contingency performance as part of its Operational Planning Analyses (OPA) and Real-time Assessments (RTA). Under the new Reliability Standards, TOPs are required to do the same. Any SOL exceedance identified in a TOP or RC OPA is required to have an Operating Plan to address the SOL exceedance. Additionally, any SOL exceedance identified in an RTA is required to have an Operating Plan implemented to address that SOL exceedance. Peak intends to continue using the Operating Guides that were collaboratively developed for each WECC Path. These Path Operating Guides provide RC System Operators and TOP System Operators with steps that can be taken when flow on the path is causing or contributing to an SOL Exceedance.

The IRO-017-1 Outage Coordination process (final version posted on 10/03/2016) requires that each TOP identify any instability risks that arise as a result of the outage conditions. If any new instability risks arise due to the outage, the TOP is responsible for establishing outage-specific stability limits and communicating the instability risk, stability limits and any associated Operating Plans to the RC. Peak will investigate each stability limitation and will apply its SOL Methodology to determine whether the stability limitation qualifies as an IROL.

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TOP-007-WECC-1a Path?	Path Name	Path Operator	Limiting Facility Part of Path	Path Limitation	Associated Contingency(ies)
	Alberta - British Columbia	AESO, BCHA	on	E-W: AESO frequency performance criterion W-E: thermal	E-W Loss of Cranbrook-Bennett 500kV tie violates AESO frequency performance criteria W-E Loss of generation within AESO
1					
3	Northwest - British Columbia	BCHA	on	thermal voltage-stability limited, thermal	Loss of Custer-Ingldow 1 & 2 and separation of BCHydro
4	West of Cascades - North	BPA	stability	(voltage stability limit monitored by NW Washington IROL)	Schultz-Raver #1 500kV & Schultz-Echo Lake #1 500kV John Day-Marion & Buckley-Marion 500kV or Ashe-Marion & Buckley-Marion 500kV
5	West of Cascades - South	BPA	off	thermal summer low voltage in winter	Bell-Coulee 500kV & Westside-Coulee 230kV or breaker failure @Taft 500kV4
6	West of Hatwai	BPA	off	thermal	Garrison-Taft #1&2 500kV
8	Montana-to-Northwest	NWMT	on	E-W thermal W-E. pre contingency voltage	Hemingway-Summer Lake 500kV or Lolo-Oxbow 230kV & Hells Canyon-Brownlee 230kV
14	Idaho-to-Northwest	IPCO	on	thermal	Midway-Gates & Midway-Lost Banos 500kV or 2 Palo Verde Units or Los Banos-Tesla & Los Banos Tracy 500kV or Tesla-Midway 1&2 500kV
15	Midway - Los Banos	CISO	off	thermal	Humboldt-Coyote Creek 345kV or Coyote Creek-Valmy (S-N)
16	Idaho - Sierra	SPPC	off	thermal	Kinport-Midpoint & Borah-Adelaide-Midpoint #1 345kV
17	Borah West	IPCO	on	thermal	Bridger-Three-Mile Knoll & Bridger-Populus 345kV (N-S) or Brady-Antelope 230kV (S-N)
18	Montana-Idaho	NWMT	on	thermal and voltage limited	Jim Bridger-Populus #1 or #2 345kV
19	Bridger West	PAC	on	thermal limit, voltage dip and frequency dip criterion	Simultaneous loss of any 2 Path 19 lines
20	Path C (Pre-Gateway)	PAC	N/A	voltage	Four Corners-Moenkopi 500kV line or either Four Corners-Cholla 345kV lines
22	Southwest of Four Corners	APS	on	thermal	Drum PH or Drum-Rio Oso #1 115kV or Drum Summit 1&2 115kV or Goldhill-Placer #2 115kV or Halsey Jct-Newark #1&2 115kV
24	PG&E - Sierra	CISO	on	thermal	Midway-Vincent #1&2 500kV or Midway-Vincent #1 & Whirlwind-Midway 500kV
26	Northern-Southern California	CISO	on	thermal	Loss of the IPPDC bi-pole line.
27	Intermountain Power Project DC	LADWP	off	thermal or post contingency voltage deviation	Craig-Bonanza 345kV
30	TOT 1A	WACM	on	thermal	Montrose-San Juan 345kV
31	TOT 2A	WACM	off	thermal	IPP-Gonder 230kV (E-W) or Robinson-Gonder 345kV (W-E)
	Pavant - Gonder 230kV;				
32	Intermountain-Gonder 230kV	SPPC	off	thermal	Sigurd-Three Peaks 345 or Three Peaks-Red Butte 345
34	(Paths 78 and 79)	PACE	off	thermal	Simultaneous Intermountain-Adelanto DC line outage
35	TOT 2C	NEVP	on	thermal	TOT 3 operating matrix; limiting contingencies vary
36	TOT 3	WACM	on	thermal	Hayden-Gore Pass 230kV or Craig-Ault 345kV or Hayden-Foidel Creek 230kV
39	TOT 5	WACM	off	thermal	Imperial Valley-Miguel 500kV
45	SDG&E - CFE	CISO	on	thermal	Imperial Valley North Gila 500kV or Palo Verde-Colorado River 500kV
46	West of Colorado River	CISO	off	thermal	Springerville-Macho Springs 345kV or West Mesa-Arroyo 345kV or Greenlee-Hidalgo 345kV
47	Southern New Mexico (NM1)	EPEC	N/A	voltage	Four Corners-Rio Puerco 345kV or San Juan-Rio Puerco 345kV
48	Northern New Mexico	PNM	on	thermal	Navajo-Crystal 500kV or Perkins-Mead 500kV or North Gila-Imperial Valley 500kV
49	East of the Colorado River	APS	on	thermal	Four Corners-Cholla 345kV
50	Cholla - Pinnacle Peak	APS	off	thermal	Yavapai-Westwing 500kV
51	Southern Navajo	APS	off	thermal	Hemingway-Summer Lake 500kV or two Jim Bridger 345kV lines or any two Brownlee-Boise Bench 230kV lines
55	Brownlee East	IPCO	on	thermal	Mohave-Lugo 500kV or Eldorado-Lugo 500kV
61	Lugo - Victorville 500kV	CISO	on	thermal	Loss of PDCI bi-pole line
65	Pacific DC Intertie (PDCI)	LADWP	off	thermal	Malin Round Mt 1 & 2
66	California-Oregon Intertie (COI)	CISO	on	thermal	ALIS stressed to reasonability limits with no limitation found
73	North of John Day	BPA	off	ALIS stressed to reasonability limits with no limitation found	Two Palo Verde Units or PDCI Bi-pole
76	Alturas Project	SPPC	off	system	S-N thermal
80	Montana Southeast	NWMT	on	thermal	N-S Midpoint-Humboldt 345kV Broadview-Garrison #1&2 500kV
SCIT		CAISO	N/A	ALIS stressed to reasonability limits with no limitation found	Tested to reasonability limit with no issues identified
COI/PDCI – North of John Day cutplane		BPA	N/A	ALIS stressed to reasonability limits with no limitation found	Loss of two Palo Verde units